UNIT 2: CREATING SYSTEMS TO MANAGE INFORMATION

Delivery guidance

Approaching the unit

This unit introduces the concept of database systems and how they store, manipulate and present data. Your learners will need to investigate how databases are used, and how they are designed, developed and maintained. In addition, learners should investigate relational database management systems; how they are used and how they are developed. Then produce their own relational database in accordance with a brief. Learners should understand that databases are very widely used in a huge range of applications with which people interact on a daily basis (including e-commerce, customer billing, stock management, manufacturing processes, logistics, healthcare, banking and the creative industries).

You will need to ensure that learners have access to an adequate relational database management system in order to complete the assessments for this unit.

This delivery guide does not cover everything that needs to be delivered for completion of this unit but gives examples of delivery methods. You should refer to the specification for full details of all the content that needs to be covered. Learners must practise the correct and full completion of any templates in the sample assessment materials (SAMs) in preparation for their internal assessment task.

Delivering the learning aims

For topic A, you could begin by discussing the types of data that might be stored by different individuals and organisations. Learners should explore why they might need this data and how it could be organised. You should explain relational database management systems (RDBMS) and the environments they are suited to.

You should aim to help your learners to become familiar with relational data structures. To do this, give them plenty of vocational examples in order to build their confidence with the components of relational data structures.

Learners must understand the process and stages of normalisation. You should make practical examples of normalisation and demonstrations of data in various normal forms available. The best learning will be achieved where learners are given sample documents that they then have to normalise – for example an invoice, with an example of a customer record, a stock record and a pricelist.
These four items would be used by any business with a retail function. An alternative could be a learner personal record, class register, course information and assessment grades. Help learners to become confident with the process of normalisation and creating data structures, as this will be a key part of the assessment. It is important that learners fully understand how to do this as otherwise the rest of the design and development process may be difficult or impossible.

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In topics B and C, learners will need to design and develop their own database using a selected relational database management system. Learners must understand what options are available and it is recommended that you introduce them to relational database management systems early in the unit to allow plenty of time for them to practise their skills and combine theory with practice.

For topic B, learners should be aware that, as with any software design, they need to be familiar with exactly what is required and the scope of the solution (what is included and what is not included). You should guide learners in the process of choosing appropriate methods to use in their designs. Introduce the techniques used in database design to help learners become confident in applying those that they will use in their own designs. As well as designing the structure of the database, learners need to be able to design a functioning user interface for their database.

You should place emphasis on the international laws, legislation and ethical considerations that impact on the storage of data, especially if the data may be sensitive (e.g. medical records).

Topic C is about implementing the design and is therefore mostly a practical topic. Help learners to prepare for the assessment by developing their skills so that they can use the database software to create a solution quickly and without assistance. Build in plenty of practise time using a range of different case studies to ensure that their skills reach the required level.

Learning aim	Key content areas	Recommended assessment approach
A Understand the purpose and structure of relational database management systems	**A1** Relational database management systems **A2** Manipulating data structures and data in relational databases **A3** Normalisation	Produce a presentation or report evaluating the role of relational database management systems in the decision-making process
B Design a relational database to meet client requirements	**B1** Relational database design **B2** Design documentation **B3** Evaluation of designs	A practical activity involving the design of a relational database to fulfil client requirements.
C Develop a relational database to meet client requirements	**C1** Producing a database solution **C2** Testing and refining the database solution **C3** Evaluation of testing **C4** Review of software solutions	Produce a functional solution including • design documentation • relational database development • testing logs

Assessment guidance

Learners will be assessed by a series of practical tasks that will assess both their ability to design a suitable database to meet a client's specification and their practical skills in using database software to implement their design. The assessment will include a series of six activities that can be completed using the software of the centre's choice. Centres should advise learners to pay careful attention to the assessment focus for each activity in the SAMs as these give the learning criteria for the assessments.

Learners should design solutions to given problems using normalisation, entity relationship diagrams (ERDs) and data dictionaries. They will need to develop their solutions by creating a database structure, importing raw data, and creating forms, queries and reports. The practical application of these skills should be supported by developing exam techniques, such as how to identify the requirements of specific command words and how to structure and present answers.

Getting started

This gives you a starting place for one way of delivering the unit. Activities are suggested in preparation for the internal assessment.

Unit 2: Creating Systems to Manage Information

Introduction

As this unit is internally assessed, it is important that you work to develop learners' practical database design and development skills to the level where they can complete the process confidently, under pressure and without assistance. You will need to plan for both practical and exam-technique practice sessions as part of your delivery.

Learning aim A: Understand the purpose and structure of relational database management systems

In topic A learners will investigate databases and relational database management systems.

- Learners will need to understand the purpose of a database; how they organise data and how it is inserted and retrieved. Learners will probably have lots of experience in using databases but might not realise that a database lies behind things like internet search engines, e-commerce sites, banking etc. Ask them to think about the way in which the data behind these systems is organised/structured as this will lead into the topic of normalisation.
- Normalisation is a key subject within this topic and one that is quite hard to grasp. You should give learners demonstrations and examples of how to normalise various examples of data and relate this to real-life scenarios. Beginning with a single document, then adding documents to increase the complexity will help learners build their understanding. It would be beneficial for learners to have sample data to review as you discuss normalisation so that they can discuss the implications on the data stored. They should practise doing this in a range of contexts. For example, a boarding kennel accommodating individual and families of dogs or cats. All animals need to have been inoculated before the start of a stay at the kennels. This will essentially mean a booking system, with customer data and animal data.
- Even at this early stage in the unit, it is probably wise to introduce learners to a relational database management system and structured query language (SQL) and allow time for learners to work with these development tools regularly. This will not only allow them to see how the theory relates to the practical application but will also give sufficient time for them to develop the required degree of skill and confidence in using these tools before the assessment.

Learning aim B: Design a relational database to meet client requirements

If learners are also completing *Unit 4: Programming*, there is some overlap with this topic and learning aim B (Design a software solution to meet client requirements) in *Unit 4*, so you may want to consider delivering some subjects covered in these units together.

- Learners will need to be familiar with techniques used in database design and be confident in applying those that they will use in their own designs.
  There is a close link with the normalisation theory taught in topic A and you may want to teach creating ERDs immediately after teaching normalisation.

- You can place learners into groups and ask them to review earlier concepts such as normalisation and the creation of ERDs and consider how these might apply to the database that they would like to design. Whether learners work individually or in groups, they will gain useful insight from group discussions and comparing each other's designs.
- Learners must be familiar with software development principles and the design documentation that is expected of them. Refer to the SAMs to see the format of the design documentation that learners will be expected to produce in the exam and ensure that they use similar documentation while practising the skills.
- Set up workshop sessions in which learners are able to review their designs with their peers and refine their designs as necessary. Learners could present the concepts of their database designs to the class and invite their colleagues to comment and suggest improvements. Learners should make a note of any refinements required.
- Learners can work in groups to develop and review user interface designs and security considerations.
- While working on understanding database design concepts, learners will need to continue to develop their skills in using database software, as designs will be easier to create if learners have a good understanding of what the software is capable of doing.

Learning aim C: Develop a relational database to meet client requirements

In this learning aim, learners will develop their skills in using database software to create a system from a design that they have produced. They should already have made some use of the database software to put the theory covered in topics A and B into practice, but this is where they will apply these skills in a practical task.

- The key to success here is being able to practise database development. Some time spent creating imaginative and different case studies will be beneficial. It may also be useful to get the learners to work on different scenarios as this will create better opportunities for learners to review and give feedback on each other's work. Scenarios could include a music shop that sells new and used musical instruments, which runs a lending service and that does instrument repairs or a peripatetic languages teacher who provides services to all local schools.
- Encourage your learners to write notes on the techniques they practise and their experiences of using them. These notes will help when they are preparing for the exam and also when they need to evaluate their databases in topic D.
- Testing is often an area that learners neglect. Encourage learners not just to think of testing in terms of whether something works or not, but also in terms of whether something can be improved. The user interface is a useful area to apply testing. Ask learners the following questions.
    - Is it clear and intuitive?
    - Will the intended users of the database be able to understand it?
    - Queries and reports are also candidates for suitability testing. Are the reports clear?
    - Does a query produce an appropriate output and are suitable fields included?

  It may be effective to do some of the testing in pairs, with learners testing and reviewing each other's databases.

- Learners could develop their skills in testing by being given databases in varying degrees of completion and with different features. They could be given a variety of activities including developing and implementing a test plan to use with the databases and responding to the provided test results for a given database. They could also test different aspects of the databases such as data input/validation and the user interface.

Learning aim C – Develop a relational database to meet client requirements

Learners will need to further develop their reviewing and evaluating skills.

- Ideally, learners will be able to evaluate some of the databases that they have created as practice in Learning Aim C. However, it may benefit them to look at some commonly used databases such as product-search databases on e-commerce websites. Learners could consider how well these databases meet their needs (e.g. how easy is it to find the product they are after? Does the search allow them to select suitable criteria? Is data presented in a helpful order? Is the interface intuitive?). This may help them to review their own databases and develop better user interfaces.
- Encourage learners to think more deeply about the process and outcome rather than simply considering whether they have produced a good database or not. They need to look at the changes that they made between design and development and think about why they made those changes. If they kept written notes while they were developing the database, they should refer to these to help in the process. Ask learners to justify their choice of relational structure, referring to their notes. Reviewing and discussing the process of normalisation, creating the ERD and then the data dictionary may help some learners understand the process better.
- Learners need to consider the quality, performance and usability of their databases. It may benefit learners to have them review each other's databases or, alternatively, present their database to the class (this will work better if, as suggested, not all learners follow the same case study at the same time). This approach may work particularly well for evaluating usability, as it is quite hard for a product's creator to judge its usability. However, when it comes to the assessment, learners must evaluate their own products so they need to learn to be critical of their own creations. One way you can facilitate this is to ask learners to write an evaluation of their database then ask others to critique the database and the evaluation.

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Details of links to other BTEC units and qualifications, and to other relevant units/qualifications

Pearson BTEC Level 3 Internationals in IT:

- *Unit 1: Information Technology Systems- Strategy, Management and Infrastructure*

Resources

In addition to the resources listed below, publishers are likely to produce Pearson-endorsed textbooks that support this unit of the BTEC Internationals in Information Technology. Check the Pearson website (http://qualifications.pearson.com/en/support/published-resources.html) for more information as titles achieve endorsement.

Textbooks

- Connolly T and Begg C – *Database Systems: A Practical Approach to Design, Implementation, and Management, Sixth Edition* (Pearson, 2014)
  ISBN 9781292061184
  This is a comprehensive book on database systems and management.

Websites

- www.Support.office.com
  The official Microsoft Office website – it contains training material for various versions of Access.
- www.oracle.com/uk/index.html
  The Oracle database documentation, which includes information on database concepts.

Pearson is not responsible for the content of any external internet sites. It is essential for tutors to preview each website before using it in class so as to ensure that the URL is still accurate, relevant and appropriate. We suggest that tutors bookmark useful websites and consider enabling learners to access them through the school/college intranet.